

Simulation of cement removal on titanium surfaces

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Introduction:

Fixed dentures become more and more luted on dental implants. Surplus of luting agents is considered to play a significant role in the occurrence of peri-implantitis.

Material and Methods:

The clinical procedure of cement removal was simulated using a model with titanium beams of 6mm diameter. Three investigators cleaned up 6 specimens which had a standardized layer of #1 zinc phosphate (Harvard, Hoffmann, Berlin, G), #2 glass ionomer (Ketac Cem, 3M ESPE, Seefeld, G), #3 resin cement (Calibra, Dentsply, Milford, USA), #4 self-adhesive composite cement (RelyX Unicem, 3M ESPE, Seefeld, G), or a #5 provisional eugenol-free cement (Provicol, Voco, Cuxhaven, G) using steel or plastic scalars. Each specimen was treated for 30sec under blinded standardized conditions. The cleaned surfaces were digitally recorded and cement remnants were evaluated using an image analysis program (Optimas Corporation 6). Statistical analysis: Mean, standard deviation, ANOVA.



Fig. 1: Samples with cement



Fig. 2: Simulation of cement removal



Fig. 3: Sample under the digital microscope



Fig. 4: Fixation unit



Fig. 5: Simulation of cement removal

Results:

Surplus of cement was found on all specimens after cleaning. The amount of remnants depended on the investigated cement and scaler type. Glass ionomer cement processed with a steel scaler showed significant less remains ($p=0.05$). However, in some cases glass ionomer cleaning was quite difficult, which explains the high standard deviation. Self-adhesive composite and provisional cement showed significant higher amounts of cement remnants after the cleaning procedure ($p<0.001$).

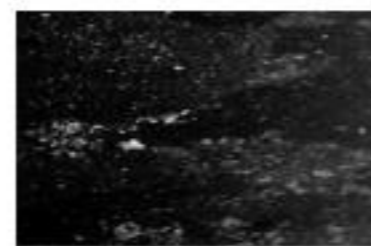


Fig. 6: Zinc phosphate cement (3 times magnification)

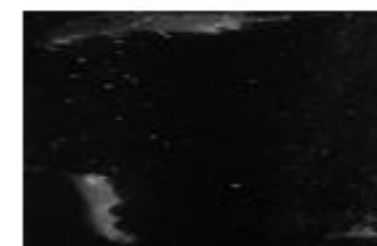


Fig. 7: Glass ionomer cement (3 times magnification)

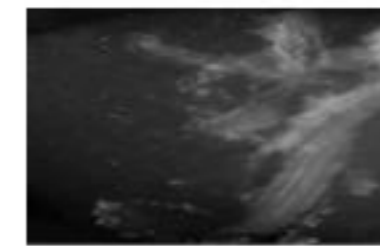


Fig. 8: Resin cement (3 times magnification)

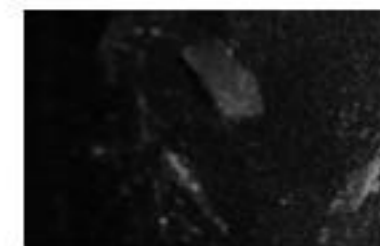


Fig. 9: Self-adhesive composite cement (3 times magnification)

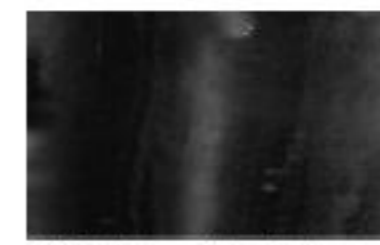


Fig. 10: Provisional cement cement (3 times magnification)

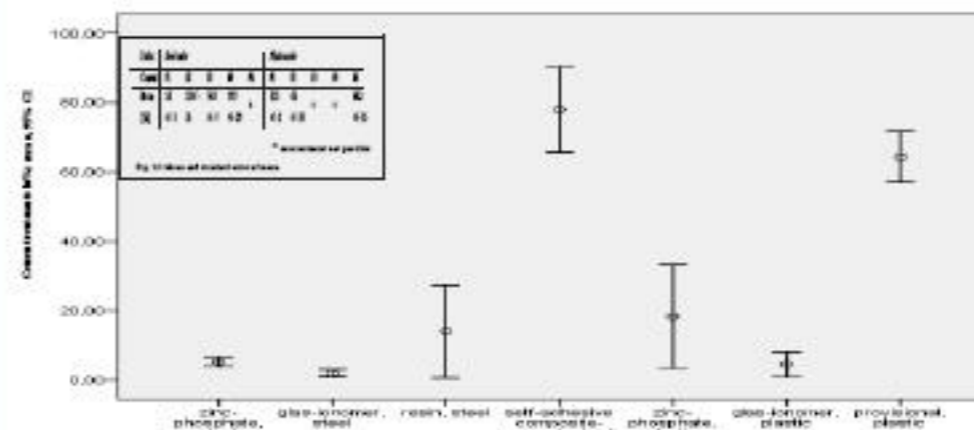


Fig. 11: Cement remnants in %

Conclusion:

Regardless of cement type and scaling treatment, there is always cement left on titanium surfaces. Clinicians should be aware of the potential risk of cements remnants by the luting procedure of fixed dentures on dental implants.